Satiety Control Through Food Structures
Made by Novel Processing:

Generating Novel Food Structures to Aid Consumer Weight Management

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Few satiety-enhancing products have successfully remained in the European market, due to the failure of producing effective and appealing products.

The SATIN consortium aims to develop novel food products for European consumers through processing innovation that will enhance satiety and help to achieve a balanced diet.
## The Consortium

<table>
<thead>
<tr>
<th>SME</th>
<th>Industry</th>
<th>Academic</th>
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</thead>
<tbody>
<tr>
<td>Axxam, Italy</td>
<td>Cargill, Belgium</td>
<td>Karolinska Insitutet-Sweden</td>
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<tr>
<td>BioActor B.V., Netherlands</td>
<td>Coca Cola Europe, Belgium</td>
<td>University Ja Virgili Rovira, Spain</td>
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<tr>
<td>CTAEX, Spain</td>
<td>Naturex, France</td>
<td>University of Aberdeen, UK</td>
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<td>CTC, Spain</td>
<td>Juver, Spain</td>
<td>University of Copenhagen, Denmark</td>
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<td>Nizo, Netherlands</td>
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<td>University of Leeds, UK</td>
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<td>ProDigest BVBA, Belgium</td>
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<td>University of Liverpool, UK</td>
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<tr>
<td>RTD Services, Austria</td>
<td></td>
<td>University of Murcia, Spain</td>
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Objectives

1. **INTEGRATE ADVANCED TECHNOLOGIES** to screen novel food structures through *in vitro* models to isolate and refine products according to their satiating potential.

2. **DEVELOP NOVEL FOOD PROCESSING TECHNOLOGIES** that combine active ingredients and changes in food structure to produce a range of novel satiety enhancing ingredients.

3. **PRODUCE FINISHED FOOD PRODUCTS** that pass through safety analysis, early sensory evaluation and consumer testing.

4. **DEMONSTRATE THE EFFECTS OF PROTOTYPE PRODUCTS** on biomarkers of satiety and on nutrient bioavailability using in vivo studies and validating new in vivo approaches.

5. **DEMONSTRATE THE EFFECTS OF FINAL FOOD PRODUCTS** on within-meal satiation, post-meal satiety and/or reduced appetite using biomarkers of satiety.

6. **DEMONSTRATE THE ENDURING EFFECTS OF INDIVIDUAL FOOD PRODUCTS** on satiety and their potential to induce weight loss.

7. **DEMONSTRATE THE LONG-TERM CONSUMER AND HEALTH BENEFITS** of adhering to a diet containing satiety-enhancing products.

8. **VALIDATE HEALTH CLAIM ENDPOINTS AND COMMERCIALISE.**
PROJECT RESULTS
**WP1 - Selection of food components & in vitro screening**

Validated *in vitro* platform for high throughput analysis developed to identify potential satiety effects of bioactive foods and food components.

SATIN foods were ranked and then selected to move on to mid- and long-term clinical trials.

<table>
<thead>
<tr>
<th>MATRIX</th>
<th>INGREDIENT</th>
<th>CELL LINES (AXXAM)</th>
<th>SHIME (ProDi)</th>
<th>SOLUBILITY, BIOAVAILABIL. (UMUR)</th>
<th>USSING CHAMBER (BioAct)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yoghurt/Pudding [NIZO]</td>
<td>Satigel ADG 38 [Cargill]</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Tomato Juice [CTAEX]</td>
<td>Polydextrose [Cargill]</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Orange Nectar [Coca-Cola]</td>
<td>NAXUS LC [BioActor]</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Fish balls [CTC]</td>
<td>Viscogum [Cargill]</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

The rank order is from 1 to 6; where 1 corresponds to the food with the most promising properties.
1. 80 food prototypes; range of product categories & eating occasions
2. Products were optimized in food structure & combined with (active) ingredients
3. Screening for flavour release during actual consumption and texture building under gastric conditions
4. Combined with the results from WP1 the six most promising products were selected for Phase 2.
5. These 6 went forward to the human intervention studies
Two human intervention studies, examined selected active ingredients (fermentable fibres)

Both studies indicated changes in gut microbiota with altered diet

Ingredients appear to target specific groups of bacteria, some of which are directly beneficial to human health

Resistant starch targeted starch fermenters and butyrate producers

B-glucan and Arabinoxylan increased species involved in acetate and butyrate production
WP4 - Validation of satiating dietary components on short & mid-term eating behaviour

- Six foods tested in gold standard in vivo studies of appetite control.
- Two displayed positive results and were taken forward into the mid-term trials.
- One mid-term trial completed; early results are positive and will be presented at UKCO 2016 in Nottingham, UK (November).
- Studies assist in potential product health claim applications at the European Food Safety Authority.
- Targeted exploitation plans will support successful products from the lab to the European market.
WP5 – Lasting Health Benefits for Consumers

• Multi-centre, (UK, Demark and Spain) large-scale (target of 300 participants), trial is ongoing.

• Examines whether a diet containing food products shown to acutely reduce energy intake can have sustained effects on energy balance and body weight regulation.

• Aims to test the hypotheses that an increase in satiety is a beneficial physiological effect.

• Results will be available by the end of 2016.
IMPACT SUMMARY (WP6)

1. Validated in vitro model developed (WP1)

2. SME partners are now able to make the in vitro platform commercially available (WP1)

3. Possible, and relatively easy, to modulate the gut microbiota using functional foods (WP3)

4. SATIN Products - developing exploitation plans for SME’s with products showing an effect in regulating appetite (WP2, WP4, WP6)

5. Developing model for health claims application (WP4, WP5, WP6)

6. Through WP5 testing the hypotheses that an increase in satiety is a beneficial physiological effect.
Lessons Learnt...

The DOW is the DOW:
Make sure everyone understands their role and their obligations

Communication and integration (*consortium thinking*): Getting folks to work together

Challenges for industry
(*e.g.* protecting IP, equity and transparency in decision making, planning commercialisation, working with rivals)

Monitoring delivery and timelines in a fully integrated (*and highly interdependent*) project.

R&D of new products is tricky and challenges will arise - be prepared and build in contingency (*you can never have enough contingency*)
Thank you!

More information:

www.satin-satiety.eu